jc714 U.S. PTO
10/06/99

A

HAVERSTOCK & OWENS LLP
260 Sheridan Avenue, Suite 420
Palo Alto, California 94306
(650) 833-0160

BOX NEW PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Attorney Docket No.: MLNR-07100

jc511 U.S. PTO
09/414307
10/06/99

NEW APPLICATION TRANSMITTAL

Sir:

Transmitted herewith for filing is the patent application of Inventor: David W. Ritter et al.

Title: **METHOD AND APPARATUS FOR RECEIVING VIDEO SIGNALS FROM A PLURALITY OF VIDEO CAMERAS**

CERTIFICATION UNDER 37 CFR § 1.10

I hereby certify that this New Application and the documents referred to as enclosed herein are being deposited with the United States Postal Service on this date, October 6, 1999, in an envelope bearing "Express Mail Post Office To Addressee" Mailing Label Number EL454480941US addressed to: **PATENT APPLICATION**, Assistant Commissioner for Patents, Washington, D.C. 20231.

Danielle Dalton
(Name of Person Mailing Paper)

Signature

Enclosed are:

1. The papers required for filing date under CFR § 1.53(b):

20 Pages of Specification (including claims); 4 Sheet(s) of Drawings.
_ Formal
X Informal

2. X Declaration or Oath
3. X Power of Attorney (Unexecuted)
4. _ Assignment of the Invention to Micro Linear Corporation (including Form PTO-1595).

Fee Calculation

_ Amendment changing number of claims or deleting multiple dependencies is enclosed.

CLAIMS AS FILED

	Number Filed	Number Extra	Rate	Basic Fee
				$760.00
Total Claims	44 - 20 =	24	$18.00	432.00
Independent Claims	3 - 3 =	0	$78.00	0.00
Multiple Dependent claim(s), if any			$260.00	
			Filing Fee Calculation	$1,192.00

6. X Verified Statement (Declaration) Claiming Small Entity Status (Unexecuted)

50% Filing Fee Reduction (if applicable) $596.00

7. Other Fees

_ Assignment Recordation Fee

__ Other 0.00

TOTAL FEES ENCLOSED **$596.00**

8. Payment of Fees

X Check in the amount of $596.00 enclosed.

9. X Authorization to Charge Additional Fees

The Commissioner is hereby authorized to charge any additional fees (or credit any overpayment) associated with this communication and which may be required under 37 CFR § 1.16 or § 1.17 to Account No. 08-1275. **An originally executed duplicate of this transmittal is enclosed for this purpose.**

10. X Return Receipt Postcard

Dated: October 6, 1999

By: Thomas B. Haverstock
Name: Thomas B. Haverstock
Registration No.: 32,571

Express Mail Label # EL454480941US

PATENT
Attorney Docket No.: MLNR-07100

Applicant Or Patentee: David W. Ritter et al.
Serial or Patent No.:
Filed or Issued: herewith
Entitled: METHOD AND APPARATUS FOR RECEIVING VIDEO SIGNALS FROM A PLURALITY OF VIDEO CAMERAS

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR § 1.9(c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

___ the owner of the small business concern identified below:
_X_ an official of the small business concern empowered to act on behalf of the concern identified below:

Name of Concern: **Micro Linear Corporation**
Address of Concern: **2092 Concourse Drive**
San Jose, California 95131

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR §§ 121.3-18, and reproduced in 37 CFR § 1.9(d), for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled **METHOD AND APPARATUS FOR RECEIVING VIDEO SIGNALS FROM A PLURALITY OF VIDEO CAMERAS** by inventor(s) David W. Ritter et al. as described in:

_X_ the specification filed herewith
___ Application Serial No. , filed
___ Patent No. , issued

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR § 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR § 1.9(d) or a nonprofit organization under 37 CFR § 1.9(e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR § 1.27).

Full Name: _____
Address: _____
[ ] Individual [ ] Small Business Concern [ ] Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR § 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name of Person Signing: J. Philip Russell

Title in Organization: Vice President of Finance & Administration

Address of Person Signing: Micro Linear Corporation, 2092 Concourse Drive, San Jose, California 95131

Dated: _____ Signature: _____

PATENT
Attorney Docket No. MLNR-07100

METHOD AND APPARATUS FOR RECEIVING VIDEO SIGNALS FROM A PLURALITY OF VIDEO CAMERAS

Field of the Invention

The present invention relates to the field of receiving video signals from a plurality of video cameras. More particularly, the present invention relates to the field of rapidly synchronizing an apparatus for sequentially receiving video signals from each of a plurality of video cameras.

Background of the Invention

A video camera typically forms an analog composite video signal which is representative of a moving optical image received by the camera. To form the video signal, a sensing spot moves across an image area according to a series of horizontal scan lines arranged from the top of the image area to the bottom of the image area. A complete scan of the image area represented by the video signal is referred to as a "frame." When the bottom of the image area is reached, the process begins again at the top thereby forming a series of frames. National Television Standards Committee (NTSC) and Phase Alternate Line (PAL) are two widely utilized standards for composite video signals.

A composite video signal generally includes a luminance component signal and a chrominance (also referred to as "chroma") component signal. The luminance component signal contains brightness information for the image. Synchronizing pulses included during horizontal and vertical blanking intervals of the luminance component signal synchronize a video decoder to the luminance signal. This allows the video decoder to distinguish each horizontal scan line and to identify the start of each frame. To form the composite video signal, the chrominance component signal is modulated by a high frequency subcarrier and is superimposed over the luminance component signal. A "color burst," which is a series of eight cycles at the subcarrier frequency, appears in blanking intervals for synchronizing the

video decoder to the chrominance component signal. The chrominance component signal contains color information for the image.

A composite video signal formed by a video camera can be communicated to a location remote from the camera where it is received by a video decoder and utilized for further processing, such as for storage and/or display. To form an image for display, an illumination spot is scanned across a display area according to a series of horizontal scan lines arranged from the top of the display area to the bottom. So that images from the composite video signal are appropriately processed, the video decoder must be appropriately conditioned according to the composite video signal. For example, the decoder must be synchronized to the phase and frequency of the luminance and chrominance signals and must appropriately control gain applied to each. In addition, dc restoration must be performed by clamping the signals to appropriate reference levels.

A finite amount of time is required to appropriately condition the video decoder according to a received video signal. Before the video decoder becomes stabilized, it first locks onto synchronization pulses of the video signal, thereby aligning itself horizontally and vertically with received video signal. Then, the video decoder locks onto the chrominance subcarrier, performs dc restoration and adjusts gain levels. Because each of these steps must be performed before the next, this process of conditioning the video decoder is time consuming. Typically, several frames are received by a video decoder before the decoder is conditioned according to the video signal. Additional time can be required prior to displaying or storing a frame while waiting for the start of the frame to occur.

Under certain circumstances, it is desired to receive video signals from a plurality of video cameras positioned at remote locations and to process the video signals at a central location. For example, a video surveillance system typically includes a plurality of video cameras placed at strategic locations of a site under surveillance. Typical sites include dwellings, such as homes and apartment buildings, and commercial or governmental sites, such as manufacturing facilities, banks, museums, offices and retail stores. The video cameras

can be placed so as to observe activities occurring in driveways, in parking lots, near doorways, in hallways, at cash registers, in stockrooms, at loading docks and in aisles. The central location can be a security desk where displays are monitored by security personnel and where video images are stored or can more simply be a storage device located in a utility room from which video images can be retrieved, should the need arise.

Fig. 1 illustrates a schematic block diagram of a video surveillance system 100 of the prior art. A plurality of (n) video cameras 102, 104 and 106 are positioned at various locations and each is coupled to provide a video signal to a respective input of a multiplexer 108. A select input of the multiplexer 108 conditions the multiplexer 108 to route a selected one of the video signals from the cameras 102-106 to an output of the multiplexer 108. The video signals formed by each camera 102-106 typically vary from each other in frequency (i.e. horizontal line rate, chrominance subcarrier frequency), phase (i.e. relative position of the beginning of lines and frames, phase of the chrominance subcarrier), amplitude (i.e. peak to peak luminance amplitude, chrominance subcarrier amplitude) and dc offset.

An output of the multiplexer 108 is coupled to a video decoder 110. The video decoder 110 receives a selected video signal from the multiplexer 108, synchronizes its internal circuits to the video signal, controls gain levels, performs dc restoration on the video signal and places the video signal into a format suitable for storage in a storage device 112 and for display by a display device 114. The multiplexer 108 is typically utilized to cycle through the cameras 102-106 in a sequence such that at least one complete frame is received from each camera and stored in the storage device 112 before moving to a next camera in the sequence. In this manner, a series of sequential frames is obtained by each camera 102-106 and stored in the storage device 112 for later retrieval.

A drawback to the surveillance system 100 illustrated in Fig. 1 is that because a finite amount of time is required to re-condition the decoder 110 each time the multiplexer 108 selects a video signal from a different one of the cameras 102-106 in the sequence, the speed at which the system 100 can scan from one camera to the next is limited. Because significant

unauthorized or criminal activity can occur in a matter of seconds, it is typically desired to complete an entire cycle of all the cameras 102-106 in less than one second. As the number of cameras is increased, however, the time required for the system 100 to perform a complete cycle of all the cameras can become unacceptably long.

To address this problem, a video surveillance system can include multiple video decoders. Fig. 2 illustrates a schematic block diagram of a video surveillance system 200 of the prior art having multiple video decoders 208-212. As shown in Fig. 2, a plurality of (n) video cameras 202, 204 and 206 are positioned at various locations and are each coupled to provide a video signal to respective one of a plurality of (n) video decoders 208, 210 and 212. Each of the video decoders 208-212 receives a video signal from the corresponding one of the cameras 202-206, synchronizes its internal circuits to the video signal, controls gain levels, performs dc restoration on the video signal and places the video signal into a format suitable for storage and display. The outputs of the video decoders 208-212 are coupled to corresponding inputs of a multiplexer 214. An output of the multiplexer 214 is coupled to an input of a storage device 216. An output of the storage device 216 is coupled to a display device 218.

Because each video camera 202-206 corresponds to a dedicated video decoder 208-212, each video decoder 208-212 remains conditioned to the video signals received from the corresponding one of the cameras 202-206. Accordingly, by appropriately controlling the multiplexer 214, the video surveillance system 200 can be rapidly cycled through all the cameras 202-206 such that the storage device 216 receives frames from each camera 202-206 in less time than would be required by the video surveillance system 100 of Fig. 1.

Due to the functions required to be performed by the video decoders 208-212, the video decoders 208-212 tend to have a relatively high cost. Accordingly, the video surveillance system 200 of Fig. 2 having multiple decoders 208-212 tends to be significantly more expensive in comparison to the system 100 of Fig. 1 which has only one decoder 110. Further, as the number of cameras increases, this cost difference also increases.

Therefore, prior video surveillance systems exhibit a trade-off in that increases in performance are accompanied by significant increases in cost. Therefore, what is needed is a technique for increasing the performance of a video surveillance system without significantly increasing its cost.

Summary of the Invention

A method and apparatus for receiving video signals from a plurality of video cameras, such as in a video surveillance system. The plurality of video cameras are positioned at various locations and are each coupled to provide a video signal to a respective input of a multiplexer. A select input of the multiplexer conditions the multiplexer to route a selected one of the video signals from the cameras to an output of the multiplexer. An output of the multiplexer is coupled to a video decoder. The video decoder receives the selected video signal from the multiplexer and is conditioned according to the video signal. This includes synchronizing the video decoder horizontally and vertically to the video signal, locking to phase and frequency of a chrominance subcarrier of the video signal, controlling a gain level for the video signal and adjusting a dc clamping level for dc restoration of the video signal. Parameters representative of at least one of these quantities, though preferably for all of these quantities, are stored in association with the identity of the corresponding video camera. The video decoder also places each video signal into a format suitable for storage in a storage device and for display by a display device.

The multiplexer is controlled to cycle through the cameras in a sequence. As each camera is selected for providing its video signal to the video decoder, the stored parameters corresponding to the camera are retrieved and utilized to initialize the video decoder for decoding the video signal. A video frame for each camera is stored before selecting a next camera in the sequence.

Therefore, the invention duplicates storage locations for storing parameters corresponding to each camera, rather than requiring multiple video decoders, as in prior

systems. As a result of storing parameters corresponding to each camera and utilizing these parameters to initialize the video decoder, the amount of time required by the present invention to condition the video decoder is significantly reduced in comparison to prior systems using a single decoder. Accordingly, the present invention allows a surveillance system to cycle through each of a plurality of cameras in less time than prior systems having a single video decoder, but without the high cost associated with prior systems which employ multiple video decoders.

Brief Description of the Drawings

Fig. 1 illustrates a schematic block diagram of a video surveillance system 100 of the prior art.

Fig. 2 illustrates a schematic block diagram of a video surveillance system 200 of the prior art having multiple video decoders.

Fig. 3 illustrates a schematic block diagram of a video surveillance system 300 in accordance with a preferred embodiment of the present invention.

Fig. 4 illustrates a flowchart in accordance with the present invention for capturing video frames from the cameras illustrated in Fig. 3.

Detailed Description of a Preferred Embodiment

Fig. 3 illustrates a schematic block diagram of a video surveillance system 300 in accordance with a preferred embodiment of the present invention. A plurality of (m) video cameras 302, 304 and 306 are positioned at various locations and are each coupled to provide a video signal to a respective input of a multiplexer 308. A select input of the multiplexer 308 conditions the multiplexer 308 to route a selected one of the video signals from the cameras 302-306 to an output of the multiplexer 308. The cameras 302-306 need not be synchronized to each other. Accordingly, video signals formed by the cameras 302-306 can vary from each other in frequency, phase, amplitude and dc offset.

An output of the multiplexer 308 is coupled to a video decoder 310. The video decoder 310 includes an analog processing block 312, a genlock block 314, an analog-to-digital converter (ADC) 316, and a digital processing block 318. The selected video signal from the output of multiplexer 308 is provided to an input of the analog processing block 312 and to an input of the genlock block 314. An output of the analog processing block 312 is coupled to an input of the analog-to-digital converter 316. Outputs of the genlock block 314 are coupled to inputs of each of the analog processing block and the analog-to-digital converter 316. An output of the analog-to-digital converter 316 is coupled to the digital processing block 318.

Although the multiplexer 308 is illustrated in Fig. 3 as a separate element from the decoder 310, it will be apparent that its function as a selector of the video signals can be performed by another circuit element, such as a switch array, and that its function can be incorporated into the decoder 310.

The analog processing block 312 includes analog signal processing elements which precondition a video signal received from the multiplexer 308 into a form suitable for the analog-to-digital converter 316. For example, the analog processing block 312 can include sample-and-hold circuitry and analog filters. The analog-to-digital converter 316 converts a preconditioned analog video signal received from the analog processing block 312 into a series of digital samples.

The genlock block 314 generates timing pulses for the analog processing block 312 and the analog-to-digital converter 316. These timing pulses are synchronous with the incoming video signal and are representative of the horizontal frequency, the horizontal phase, the chrominance frequency and chrominance phase associated with the incoming video signal. The genlock block 314 includes a number of registers 320 for storing parameters which are representative of some or all of these quantities. Thus, the registers 320 preferably store a horizontal frequency parameter, a horizontal phase parameter, a chrominance frequency parameter and a chrominance phase parameter. These parameters are particular to the camera

302, 304 or 306 which is currently supplying the video signal to the decoder 310.

The digital processing block 318 receives the series of digital samples from the analog-to-digital converter 316 and converts these samples into a form suitable for storage and display. For example, the digital processing block 318 can convert NTSC digital video samples into luminance-chrominance (Y-C) samples, compressed Y-C samples, or into red-green-blue (RGB) component video samples, as appropriate. Preferably, the digital processing block 320 performs automatic gain control (AGC), automatic color control (ACC) and dc restoration. The digital processing block 318 includes a number of registers 322 for storing parameters which are representative of some or all of these quantities. Thus, the registers 322 preferably store an AGC gain parameter, an ACC gain parameter, and a clamp level parameter. The clamp level parameter is for performing dc restoration on the digital samples. These parameters are particular to the camera 302, 304 or 306 which is currently supplying the video signal to the decoder 310.

A storage and display processing block 324 receives digital samples from the digital processing block 318 and stores the samples according to video frames.

Note that for black and white video images, the chrominance component signal is not utilized. In which case, the video decoder 310 is conditioned according to the phase and frequency of the luminance component signal and appropriately controls the gain and dc restoration of the luminance component signal.

A controller block 326 is coupled to the select input of the multiplexer 308 for selecting one of the video signals from the cameras 302-306 to be provided to the decoder 310. In addition, the controller 326 is coupled to the genlock block 314 and to the digital signal processing block 318 for conditioning the genlock block 314 and digital signal processing block 318. For example, the controller 326 selects an appropriate format for the incoming video, such as NTSC and PAL, places the genlock block 320 and the digital signal processing block 318 in run, standby and off modes and performs write and read operations to and from the registers 320, 322, memory 330 and storage and display processing block 324.

The controller 326 controls the storage and display of video frames by the storage and display processing block 324. For example, the controller 326 indicates to the storage and display processing block 324 when the start of a frame to be stored occurs and when its end occurs.

Fig. 4 illustrates a flowchart in accordance with the present invention for capturing video frames from the cameras 302-306 illustrated in Fig. 3. The flowchart illustrated in Fig. 4 controls operation of the video surveillance system 300 illustrated in Fig. 3. Thus, referring to Figs. 3-4, program flow begins in a start state 402. From the start state 402, program flow moves to a state 404. In the state 404, the controller 326 conditions the multiplexer 308 to select a next one of the cameras 302-306 for supplying a video signal to the decoder 310.

Then, program flow moves from the state 404 to a state 406. In the state 406, the controller 326 loads parameters into registers 320 and 322 which are particular to the camera selected in the state 404. These parameters were previously obtained and stored by the controller 326 in association with an identification of the camera or in storage locations which are associated with the corresponding camera. Thus, the controller 326 maintains a set of parameters for each of the cameras 302-306. These parameters can be stored in the storage and display processing block 324 or in the memory 330. A significant aspect of the present invention is that these parameters serve as initial conditions for conditioning the decoder 310 according to the selected one of the video signals.

In the preferred embodiment, the parameters supplied to the decoder 310 include, horizontal frequency, horizontal phase, chrominance frequency, chrominance phase, AGC gain, ACC gain and dc clamping level. It will be apparent, however, that the principle advantages of the present invention can be achieved by supplying less than all of these parameters to the decoder 310. For example, because a significant amount of time is required for a conventional video decoder to obtain the horizontal frequency of a video signal, an embodiment of the present invention may supply only the horizontal frequency parameter to the decoder 310.

From the state 406, program flow moves to a state 408. In the state 408, the decoder

310 becomes conditioned according to the video signal being received. Because the parameters loaded in the state 406 were previously obtained for the currently selected camera and because these parameters change slowly over time and serve as initial conditions for the state 408, the conditioning of the decoder 310 which occurs in the state 408 takes significantly less time than if no initial conditions were supplied. During the state 408, the parameters stored in the registers 320 and 322 are updated to reflect any changes that have occurred in the video signal formed by the currently selected camera since the previous time the parameters were stored.

From the state 408, program flow moves to a state 410. In the state 410, a video frame representative of an image received by the currently selected one of the cameras 302-306 is captured and stored by the storage and display processing block 324. In the preferred embodiment, the stored video frame is received contiguously from top-to-bottom. Accordingly, storage of the video frame does not begin until the start of the frame occurs. Alternately, however, the stored video frame is a bottom portion of a first frame and a top portion of a next frame. Post-processing can be utilized to correct any discontinuities in the image caused by moving objects. An advantage of this technique of storing portions of two frames is that storage can begin immediately upon completion of the state 408 without having to wait for the start of frame to occur.

Then, program flow moves to a state 412. In the state 412, the updated parameters stored in the registers 320 and 322 are provided to the controller 326 which then maintains the parameters in association with the identification of the currently selected one of the cameras 302-306 until a next time the multiplexer 308 is conditioned to select the video signal from the corresponding camera. As mentioned, these parameters can be stored in the storage and display processing block 324 or in the memory 330.

From the state 412, program flow returns to the state 404 where a next one of the cameras 302-306 is selected by the controller 326. The states illustrated in Fig. 4 are repeated for each of the m cameras 302-306. A complete cycle includes performance of the steps 404-

412 for each of the cameras 302-306. Though the video surveillance system 300 can switch from camera-to-camera in a predetermined order, it is not necessary. For example, the next camera can be selected in the state 404 at random or in response to operator input.

An optional enhancement to the present invention includes observing changes in the value of a parameter, such as horizontal frequency, horizontal phase, chroma frequency, chroma phase, AGC gain, ACC gain or dc clamping level, and, then, utilizing the changes to predict future changes in the parameter. For example, referring to Figs. 3-4, assume that a value for the chrominance phase for a particular one of the cameras 302-306 increases over time. In which case, in the state 408, the video decoder 314 increases the value for this parameter, as needed. This increase can be observed by calculating a difference between the chrominance phase parameter in state 406, which is a prior value obtained from the particular one of the cameras 302-306, and in the state 410, which is a current value obtained for the camera. It is likely that in a next cycle, this parameter will have changed again by an approximately corresponding amount. Accordingly, the calculated difference can be added to the chrominance phase parameter obtained in the state 410 prior to storing the value for the next cycle. Alternately, the calculated difference can be added to the chrominance phase parameter in the state 406 upon retrieving the value for a prior cycle. Accordingly, this aspect of the present invention attempts to predict future changes in the parameters based upon past changes to further reduce the time required in the state 408 for the video decoder to become conditioned according to the video signal received from each of the cameras 302-306.

An aspect of the present invention takes into account the need to obtain values for each of the parameters, such as horizontal frequency, horizontal phase, chroma frequency, chroma phase, AGC gain, ACC gain and dc clamping level, upon start-up of the video surveillance system 300. Referring to Figs. 3-4, because values for these parameters have not yet been obtained, additional time is required in the state 408 for each of the cameras 302-306 before the video decoder 310 becomes appropriately conditioned to the video signal in comparison to the time required once the system 300 is up and running. In a first

embodiment, this is accomplished during a first cycle through all the cameras 302-306 by allotting extra time in the state 408 to allow the video decoder 310 to become conditioned according to the video signal received from each camera 302-306. For each camera 302-306, the parameters are stored in the state 410. Then, because these stored parameters are utilized to initialize the video decoder 310 in a subsequent cycle, time allotted in the state 408 for each camera 302-306 can be reduced. Thus, upon completion of this first cycle, a video frame is captured in the state 410 from each of the cameras 302-306.

In an alternate embodiment, the time required for the video decoder 310 to become conditioned according to each video signal is accumulated over two or more cycles through all of the cameras 302-306. Accordingly, upon start-up of the video surveillance system 300, the time allotted for each video signal in the state 408 during a first cycle through all of the cameras 302-306 is limited such that the video decoder 310 is only partially conditioned upon completion of the first cycle. In a second or subsequent cycle, conditioning of the video decoder 310 for each video signal is completed. Obtaining a video frame in the state 410 is not accomplished until the second or subsequent cycle. Thus, according to this embodiment of the present invention, two or more cycles are required to capture a video frame from each of the cameras 302-306.

The present invention has been described in terms of specific embodiments incorporating details to facilitate the understanding of the principles of construction and operation of the invention. Such reference herein to specific embodiments and details thereof is not intended to limit the scope of the claims appended hereto. It will be apparent to those skilled in the art that modifications may be made in the embodiment chosen for illustration without departing from the spirit and scope of the invention.

Claims

What is claimed is

1. An apparatus for receiving video signals from a plurality of video cameras wherein the apparatus comprises:

a. a selector having a plurality of inputs wherein each input receives one of a plurality of video signals;

b. a video decoder coupled to an output of the selector wherein the video decoder receives a selected one of the plurality of video signals; and

c. a controller coupled to the video decoder wherein the controller conditions the video decoder according to a parameter representative of the selected one of the video signals.

2. The apparatus according to claim 1 further comprising a memory device coupled to the controller for storing the parameter in association with an identification of a corresponding one of the video cameras.

3. The apparatus according to claim 1 further comprising a memory device coupled to the controller for storing the parameter in a storage location which is associated with the corresponding camera.

4. The apparatus according to claim 1 wherein the parameter is a selected one of a plurality of stored parameters, wherein each stored parameter corresponds to one of the plurality of video cameras.

5. The apparatus according to claim 1 wherein the parameter is obtained from the

video decoder.

6. The apparatus according to claim 1 wherein the selector is a multiplexer.

7. The apparatus according to claim 1 wherein the parameter is a horizontal frequency of the video signal.

8. The apparatus according to claim 1 wherein the video decoder comprises a genlock block.

9. The apparatus according to claim 8 wherein the video decoder further comprises an analog-to-digital converter for converting the selected one of the video signals into a series of digital samples wherein the analog-to-digital converter performs sampling according to pulses received from the genlock block.

10. An apparatus for receiving video signals from a plurality of video cameras wherein the apparatus comprises:

a. a selector having a plurality of inputs wherein each input receives one of a plurality of video signals;

b. a video decoder coupled to an output of the selector wherein the video decoder receives a selected one of the plurality of video signals; and

c. a controller coupled to the video decoder wherein the controller conditions the video decoder according to a plurality of parameters representative of the selected one of the video signals.

11. The apparatus according to claim 10 further comprising a memory device coupled to the controller for storing the plurality of parameters in association with an

identification of a corresponding one of the video cameras.

12. The apparatus according to claim 10 further comprising a memory device coupled to the controller for storing the plurality of parameters in a storage location which is associated with the corresponding camera.

13. The apparatus according to claim 10 wherein the plurality of parameters are a selected set of a plurality of stored sets of parameters, wherein each stored set of parameters corresponds to one of the plurality of video cameras.

14. The apparatus according to claim 10 wherein the parameter is obtained from the video decoder.

15. The apparatus according to claim 10 wherein the selector is a multiplexer.

16. The apparatus according to claim 10 wherein the parameter is a horizontal frequency of the video signal.

17. The apparatus according to claim 16 wherein the parameter is a horizontal phase of the video signal.

18. The apparatus according to claim 10 wherein the parameter is a horizontal phase of the video signal.

19. The apparatus according to claim 10 wherein the parameter is a chrominance frequency of the video signal.

20. The apparatus according to claim 19 wherein the parameter is a chrominance phase of the video signal.

21. The apparatus according to claim 10 wherein the parameter is a chrominance phase of the video signal.

22. The apparatus according to claim 10 wherein the parameter is a gain level for the video signal.

23. The apparatus according to claim 10 wherein the parameter is a dc clamping level for the video signal.

24. The apparatus according to claim 10 wherein the video decoder comprises a genlock block.

25. The apparatus according to claim 24 wherein the video decoder further comprises an analog-to-digital converter for converting the selected one of the video signals into a series of digital samples wherein the analog-to-digital converter performs sampling according to pulses received from the genlock block.

26. A method of receiving video signals from a plurality of video cameras wherein the method comprises steps of:

a. selecting one of the plurality of video cameras for providing a video signal to a video decoder;

b. retrieving a parameter representative of the video signal from a memory store; and

c. conditioning the video decoder according to the parameter.

27. The method according to claim 26 further comprising a step of capturing a video frame from the selected one of the plurality of video cameras.

28. The method according to claim 27 further comprising a step of storing the captured video frame.

29. The method according to claim 27 further comprising a step of completing a cycle wherein the step of completing the cycle comprises performing the steps of selecting, retrieving, conditioning and capturing for each camera of the plurality.

30. The method according to claim 26 further comprising a step of updating the parameter according to the video signal thereby forming an updated parameter.

31. The method according to claim 30 wherein the step of updating the parameter comprises a step of forming a predicted value for the parameter.

32. The method according to claim 31 wherein the step of forming a predicted value for the parameter comprises steps of:

a. calculating a difference between prior value obtained for the parameter and a current value obtained for the parameter; and

b. combining the difference with the current value.

33. The method according to claim 30 further comprising a step of storing the updated parameter in association with an identification of the selected one of the plurality of video cameras.

34. The method according to claim 33 further comprising a step of selecting a next

one of the plurality of cameras according to a sequence.

35. The method according to claim 30 further comprising a step of storing the updated parameter in a storage location which is associated with the corresponding camera.

36. The method according to claim 35 further comprising a step of selecting a next one of the plurality of cameras according to a sequence.

37. The method according to claim 26 further comprising a step of initializing the apparatus upon start-up by obtaining an initial value for the parameter corresponding to each video signal during a first cycle through all of the cameras wherein a video frame is captured from each camera during the first cycle.

38. The method according to claim 26 further comprising a step of initializing the apparatus upon start-up by performing two or more cycles through all of the cameras and wherein a video frame is captured from each camera only upon completion of the two or more cycles.

39. The method according to claim 26 wherein the parameter is a horizontal frequency of the video signal.

40. The method according to claim 39 wherein the parameter is a horizontal phase of the video signal.

41. The method according to claim 40 wherein the parameter is a chrominance frequency of the video signal.

42. The method according to claim 41 wherein the parameter is a chrominance phase of the video signal.

43. The method according to claim 26 wherein the parameter is a gain level for the video signal.

44. The method according to claim 43 wherein the parameter is a dc clamping level for the video signal.

Abstract

A method and apparatus for receiving video signals from a plurality of video cameras, such as in a video surveillance system. The video cameras are each coupled to provide a video signal to a respective input of a multiplexer. The multiplexer routes a selected one of the video signals to a video decoder. The video decoder receives the selected video signal and is conditioned according to the video signal. This includes synchronizing the video decoder to a frequency and phase of the video signal, controlling a gain level for the video signal and adjusting a dc clamping level for dc restoration of the video signal. Parameters representative of each of these quantities are stored in association with the identity of the corresponding video camera. The video decoder also places each video signal into a format suitable for storage in a storage device and for display by a display device. As the multiplexer is utilized to cycle through the cameras according to a sequence, the parameters for each camera are retrieved and utilized to initialize the video decoder for decoding the video signal received from the corresponding camera. As a result, the amount of time required to condition the video decoder according to the video signal received from each camera is significantly reduced. Accordingly, the present invention allows a surveillance system to cycle through a plurality of cameras in less time than prior systems having a single decoder, but without higher costs associated with prior systems which employ multiple video decoders.

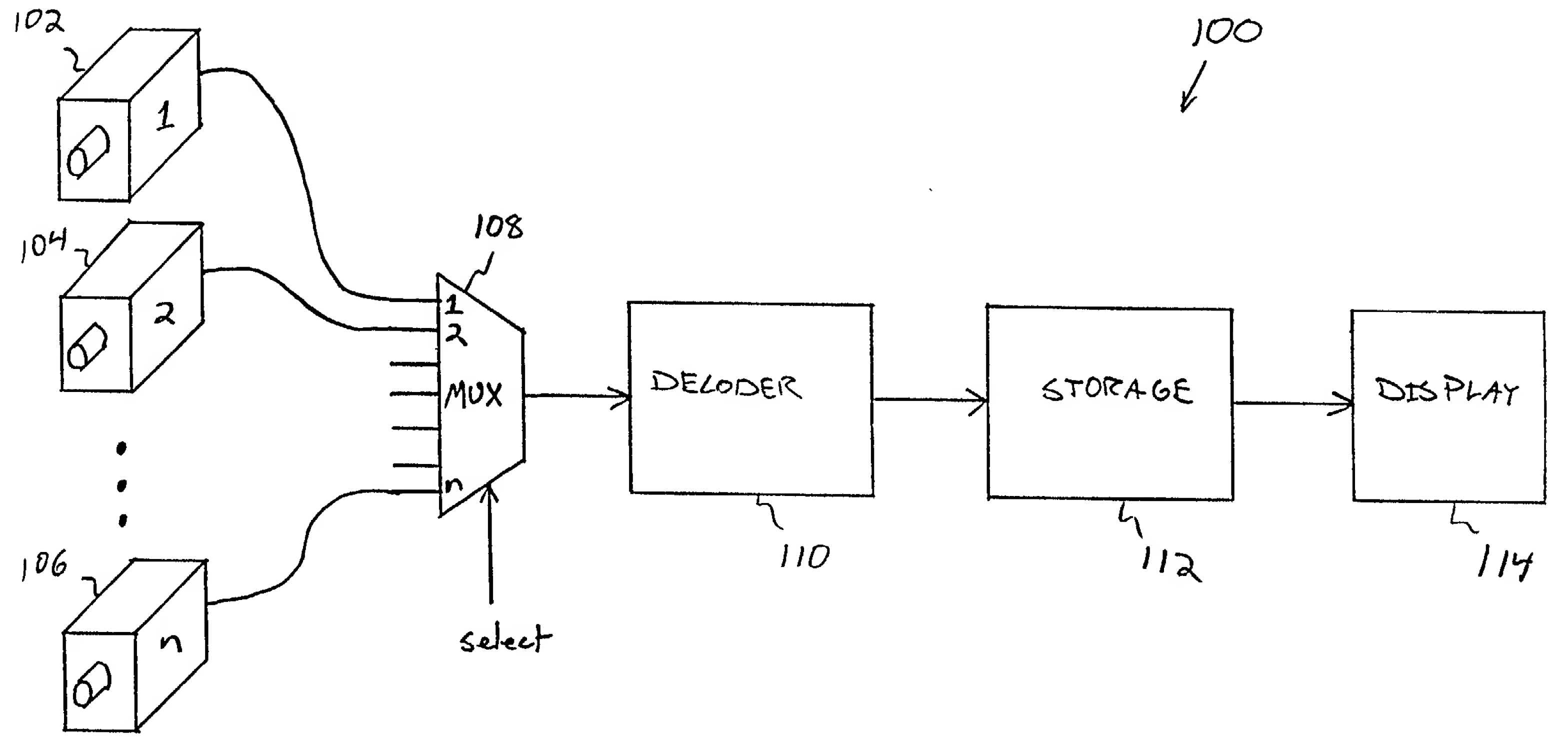


Fig 1
(Prior Art)

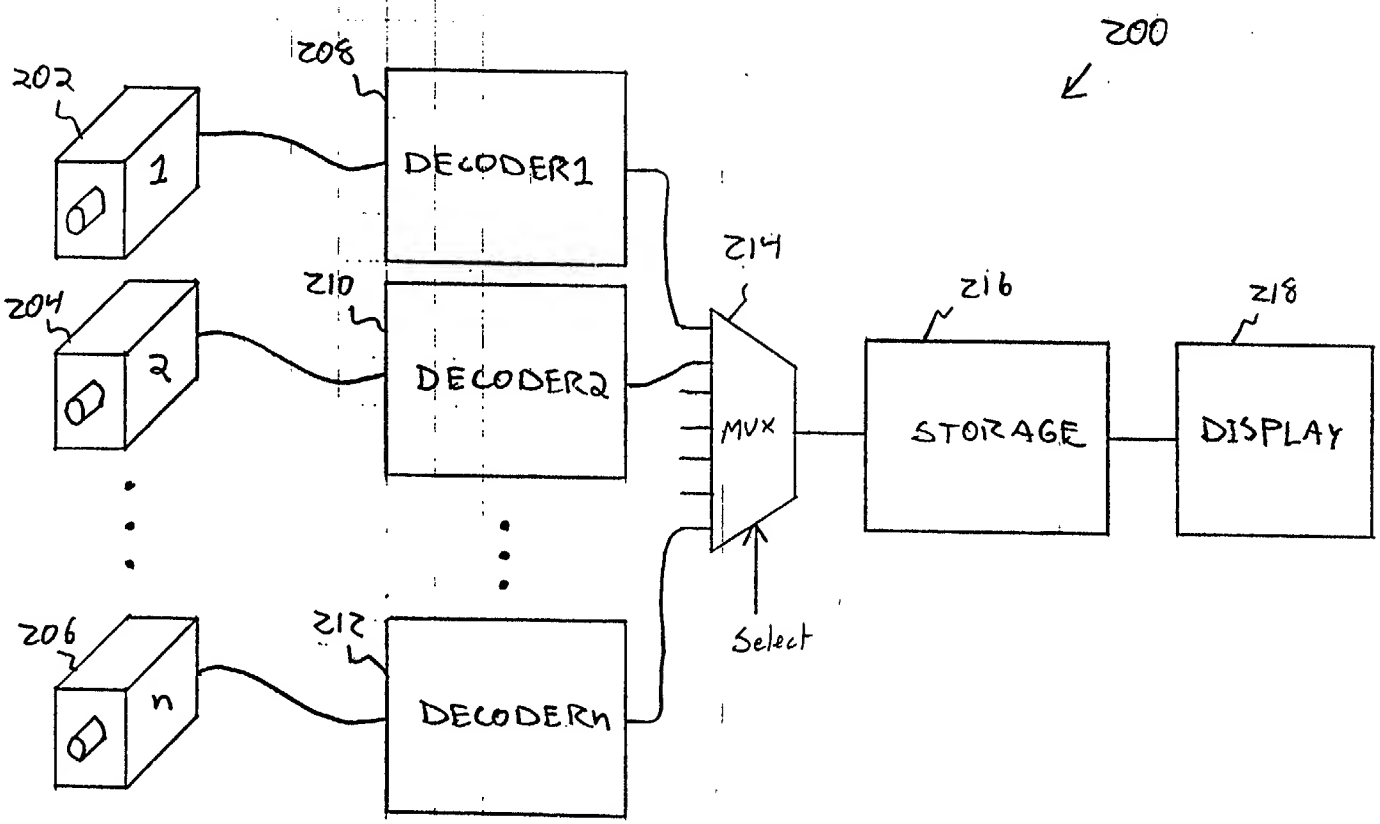


Fig. 2

(Prior Art)

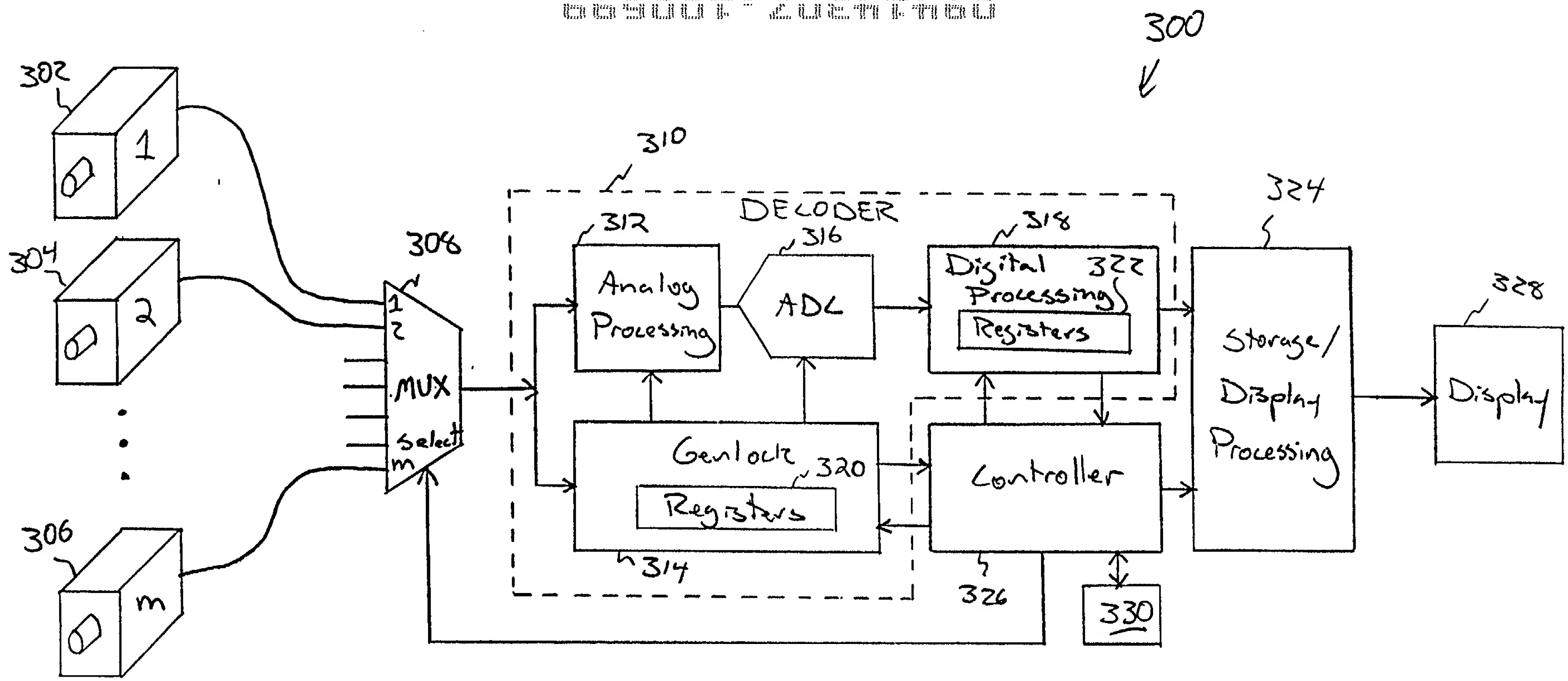


Fig. 3

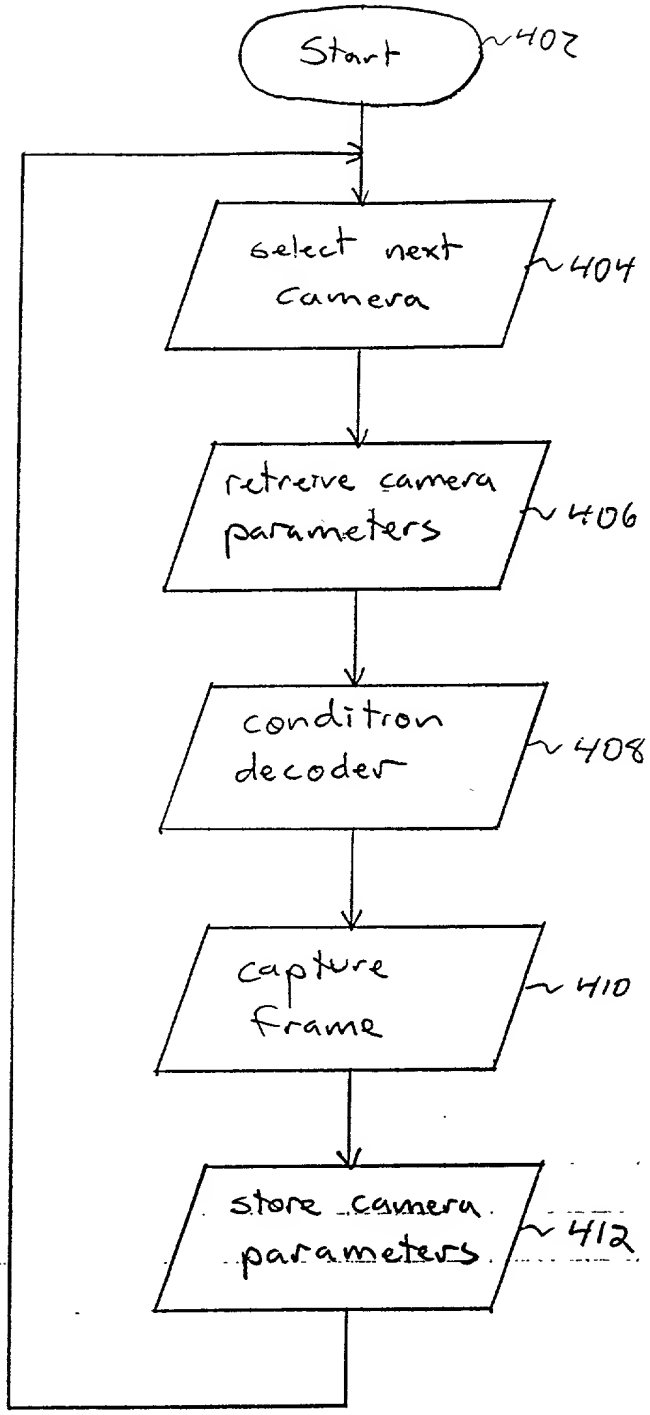

Start
402
select next camera
404
retrieve camera parameters
406
condition decoder
408
capture frame
410
store camera parameters
412

Fig. 4

DECLARATION FOR PATENT APPLICATION

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name. I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled: **METHOD AND APPARATUS FOR RECEIVING VIDEO SIGNALS FROM A PLURALITY OF VIDEO CAMERAS.** The specification of which is attached hereto. I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

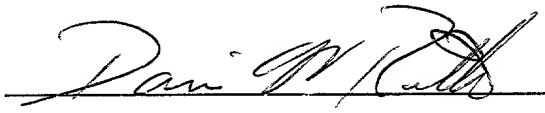
Prior Foreign Application(s)			Priority Claim	
			Yes	No
Number	Country	Day/Month/Year Filed		

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status: Patented, Pending, Abandoned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First Joint Inventor: David W. Ritter

Inventor's Signature:  9/21/99
Date

Residence: 3131 Kermath Drive, San Jose, California 95132
Citizenship: United States
Post Office Address: 3131 Kermath Drive, San Jose, California 95132

Full Name of Second Joint Inventor: Ara Bicakci

Inventor's Signature: _____
Date

Residence: 1982 Via Reggio Court, San Jose, California 95132
Citizenship: Turkey
Post Office Address: 1982 Via Reggio Court, San Jose, California 95132

DECLARATION FOR PATENT APPLICATION

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name. I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled: **METHOD AND APPARATUS FOR RECEIVING VIDEO SIGNALS FROM A PLURALITY OF VIDEO CAMERAS**. The specification of which is attached hereto. I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claim	
			Yes	No
Number	Country	Day/Month/Year Filed		

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status: Patented, Pending, Abandoned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of First Joint Inventor: David W. Ritter

Inventor's Signature: _____ Date

Residence: 3131 Kermath Drive, San Jose, California 95132
Citizenship: United States
Post Office Address: 3131 Kermath Drive, San Jose, California 95132

Full Name of Second Joint Inventor: Ara Bicakci

Inventor's Signature:  7/1/99
Date

Residence: 1982 Via Reggio Court, San Jose, California 95132
Citizenship: Turkey
Post Office Address: 1982 Via Reggio Court, San Jose, California 95132

PATENT
Attorney Docket No.: MLNR-07100

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	Group:
	)	Art Unit:
David W. Ritter *et al.*	)	Examiner:
	)	
Serial No.:	)	
	)	
Filed: herewith	)	**POWER OF ATTORNEY BY ASSIGNEE**
	)	
For: **METHOD AND APPARATUS FOR RECEIVING VIDEO SIGNALS FROM A PLURALITY OF VIDEO CAMERAS**	)	

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Micro Linear Corporation, Assignee of the above-identified application by Assignment dated_____ hereby appoints the members of the firm of HAVERSTOCK & OWENS LLP, a firm including Thomas B. Haverstock (Reg. No. 32,571), Jonathan O. Owens (Reg. No. 37,902) and Derek J. Westberg (Reg. No. 40,872), 260 Sheridan Avenue, Suite 420, Palo Alto, California 94306, telephone: (650) 833-0160, facsimile: (650) 833-0170, as its attorneys with full power of substitution to prosecute this application and to transact all business in the Patent and Trademark Office in connection therewith.

Please direct all correspondence regarding this application to the following:

Thomas B. Haverstock
HAVERSTOCK & OWENS LLP
260 Sheridan Avenue, Suite 420
Palo Alto, California 94306
Telephone: (650) 833-0160
Facsimile: (650) 833-0170

I hereby certify that the Assignment document filed with the application or filed subsequent to the filing date of the application, has been reviewed and I hereby certify that, to the best of my knowledge and belief, title is with **Micro Linear Corporation**.

Micro Linear Corporation

Dated:_____

By:_____
Name: J. Philip Russell
Title: Vice President of Finance & Administration